MEAN ATOMIC WEIGHT OF CHELYABINSK AND OLIVENZA LL5 CHONDRITES.

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Introduction: Knowledge of mean atomic weight is useful to characterize terrestrial and extraterrestrial minerals and rocks, planets, moons, and asteroids [1-3]. Mineralogy, petrology and selected physical properties of Chelyabinsk chondrite (LL 5, S4, W0) have been studied since its fall on February 15th, 2013 [4-7]. Olivenza (LL5, S3, W0) belongs to the same meteorite group, and its fall took place on June 19th, 1924 in Spain. The aim of the paper was to determine and analyze mean atomic weight of Chelyabinsk and Olivenza OC chondrites. Literature data on mean bulk elemental and oxide composition of the meteorites have been used to calculate mean atomic weight [6-8].

Methods: To determine mean atomic weight *Amean* values the following relationship was used

$$Amean = \sum wi / \sum (wi/Ai), \quad (1)$$

where *wi*(wt%) is the mass fraction of i*th* element and i*th* oxide, *Ai* is the atomic weight of i*th* element, and mean atomic weight of i*th* oxide.

Results: It has been established that Chelyabinsk's *Amean* = 23.52 is intermediate between mean atomic weight of LL chondrites *Amean* = 23.00 and L chondrites *Amean* = 23.70. Composition with light lithology gives *Amean* = 23.47**,** and with dark lithology *Amean* = 23.63. Using Jarosewich's data [8] for composition of Olivenza chondrite gives *Amean* = 23.15, which is very close to average *Amean* = 23.00 value for LL chondrites, and is close to *Amean* = 22.90 calculated for LL falls.

Relationship between mean atomic weight and atomic ratio *Fe/Si* of the ordinary chondrites has been established. It is given by the equation

$$Amean = (5.72 \pm 0.52) \cdot Fe/Si + (20.25 \pm 0.34), \quad (2)$$

for which $R^2 = 0.996$, and RMSE = 0.12.

Equation (2) leads to *Amean* = 23.07 for Olivenza (*Fe/Si* = 0.4928), to *Amean* = 23.37 for Chelyabinsk light lithology (*Fe/Si* = 0.5448), and to *Amean* = 23.52 for Chelyabinsk dark lithology (*Fe/Si* = 0.5711). This means that the prediction of *Amean* values based on eq. (2) and *Fe/Si* ratio is satisfactory.

Conclusions: Mean atomic weights of Chelyabinsk and Olivenza meteorites are comparable with average *Amean* values for LL chondrites. Relationship between *Fe/Si* atomic ratio and mean atomic weight of ordinary chondrites has been established which enables one to predict *Amean* values.

References: [1] Szurgot M. 2015. Abstract #1536.pdf. 46th Lunar & Planetary Science Conference. [2] Szurgot M. 2015. Abstract #5001. Comparative Tectonics and Geodynamics. [3] Szurgot M. 2015. *Acta Societatis Metheoriticae Polonorum* 6:107-128. [4] Kohout T. et al. 2014. *Icarus* 228:78-85. [5] Popova O.P. et al. 2013. *Science* 342:1069-1073. [6] Galimov E. M. et al. 2013. *Geochemistry International* 51:522-539. [7] Pillinger C.T. et al. 2013. *Geochemistry International* 51:540-548. [8] Jarosewich E. 1990. *Meteoritics* 35: 323–337.